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LEAD TECHNICAL ABSTRACTS

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LEAD DEVELOPMENT ASSOCIATION

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A selection of Abstracts of Literature and Patents
on the Utilisation of Lead and its Alloys

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In the event of books, documents, articles and patents, quoted in Lead Technical Abstracts, being unobtainable from or through local libraries, technical booksellers (many of whom provide an international service) or appropriate government departments, applicants should notify their difficulties to the Association, which will do its best to assist.

ALLOYS

706 The Solution Rate of Copper, Nickel, and their Alloys in (Molten) Lead — **D. A. Stevenson and J. Wulff**

Trans. AIME Met. Soc., April, 1961, 221(2), 279–285.

A study under dynamic conditions at 527°C and 727°C.

707 The Effect of Arsenic and Tellurium on the Surface Tension of Lead — **D. J. Harvey**

Trans. AIME Met. Soc., April, 1961, 221(2), 266–270.

Determinations of surface tensions of 10.53at% As and 6.70at% Te up to 700°C and also of high purity lead (99.999%). Both As and Te are surface active in lead.

ANALYSIS

708 Methods for Emission Spectrochemical Analysis — **American Society for Testing Materials**

Book (3rd Edition), Dec., 1960, 685pp. ASTM, 1916 Race Street, Philadelphia 3, Pa. $11.

General practices; nomenclature and analysis of lead and several other ferrous and non-ferrous metals are included in a description of 121 methods of analysis. Various non-metals are also covered.

709 Polarographic Determination of Antimony in Refined Lead — **V. T. Athavale and others**

Analyst, June, 1961, 86, 399–401.

The method described uses 1 N H_2SO_4 as a supporting electrolyte. It is applicable down to 10ppm on a 1g sample. Tin content must be less than antimony to avoid interference.

710 Paper Chromatographic Separation of Bismuth, Cadmium, Copper, Lead and Mercuric Mercury Metals — **V. K. Mohan Rao**

J. Sci. Ind. Res. (India), March, 1961, 20B(3), 109–111.

711 Some Studies of the Performance of the K.1000 Cathode Ray Polarograph and Associated Anodic Conversion Unit. (Cu, Pb, Cd & Zn.) — **J. O. Howden and G. F. Reynolds**

Metallurgia, May, 1961, 63, 253–260.

In describing the performance of the Southern Instruments K.1000, limits of detection; resolution and ability to tolerate higher concentration of more noble species are described.

712 Methods for the Sampling and Analysis of Tin and Tin Alloys — **British Standards Institution**

British Standard 3338, Parts 3, 4, 5, 6, 8, 10, 1961, London, W.1.

Part 4. "Copper in Ingot Tin and Tin-Lead Solders (Photometric method)". 8 pp. 3/-.

Part 5. "Lead in Ingot Tin and Tin-Antimony Solders (Photometric method)". 8 pp. 3/-.

713 Fluorescent X-ray Spectograph for Dynamic Selective Oxidation Rate Studies : Design and Principles — **W. J. Campbell and M. Leon**

U.S. Bur. Mines. Rep. Inv. 5739, 1961, 21 pp.

Design and construction of a spectograph for dynamic rate studies of selective oxidation in molten metals. Preliminary studies of arsenic and antimony in lead indicate the particular usefulness of the method for trace elements.

714 Rapid Determination of Aluminium, Iron, Copper, Cadmium and Lead in Zinc-base Alloys — **R. J. Gajan and D. M. Geehan**

U.S. Bur. Mines. Rep. Inv. 5727, 1961, 10 pp. Met. Ind., April 21, 1961, 19(16), 319–320.

Complete determination takes less than three hours. Lead is determined with copper and cadmium polarographically.

ATOMICS

715 Test Stations for Non-Destructive Testing of Materials with Gamma Rays — **H. Bohme**

Giessereitechnik, May, 1961, 7(5), 131–135.

(In German.) Describes use of Co50, Co60 and Cs137 as gamma ray sources in Russian type of test unit. Gives nomograms for determining shielding thickness in lead, iron and concrete.

BEARINGS

716 Machining of Copper-Lead Sintered (Bearing) Material — **W. S. McDougall and P. T. Wilkinson**

N.E.L. Plasticity Report 181, 1961, 11 pp., National Engineering Laboratory, East Kilbride, Glasgow.

General description of cutting speeds, wear experiments and surface finish tests.

717 How Good are Solid-Film Lubricants for Extreme Environments — **B. D. McConnell**

Product Eng., June 12, 1961, 32(24), 70–73.

Describes properties of solid film lubricants. Wear life of lead sulphide films bonded with B_2O_3, lead sulphide-MoS_2 and lead sulphide-graphite films, among others.

718 **Electrodeposition in Plain Bearing Manufacture** — **P. G. Forrester**

Trans. Inst. Met. Finishing, May, 1961, 38(2), 52–58.

Plating is the standard method used for providing thin lead alloy overlays on copper lead bearings. Details of application of overlays and limitations. Plating for bonding in bi-metals and for protection against corrosion.

COATINGS

719 **The Structure of Some Electrodeposited Tin Alloy Coatings** — **R. F. Smart, R. M. Angles and D. A. Robins**

J. Inst. Metals, May, 1961, 89(9), 349–353.

Metallography and X-ray diffraction are used to study structures of tin, lead and other electrodeposits over a wide range of compositions.

CORROSION

720 **Pitting and Surface Film Formation on Lead** — **E. L. Schmeling and B. Roschenbleck**

Werkstoffe u. Korrosion, April, 1961, 12(4), 215–223.

(In German.) Measurements have been made of current density/potential relationship for lead in various solutions capable of surface film formation. Effects of chloride additions to the electrolyte with cathodic and anodic polarisation are investigated.

721 **Systematics of Corrosion of Metals in Soil. 5—Aluminium. 6—Lead, Zinc and Aluminium Coatings.** — **T. Markovic and Lj. Rubinic**

Werkstoffe u. Korrosion, Jan., Feb., 1961, 12(1), (2), 16–18, 85–88.

(In German.) Part 6. Results of field tests with metallic coatings by the U.S. National Bureau of Standards are discussed. Gives corrosion rate/pH diagrams.

ELECTRO-PHYSICS

722 **Thermoelectric Properties of the Noble Metals and their Alloys** — **A. A. Rudnitskii**

AEC-tr-3724, 1959. (Translation of a Russian publication of 1956), 234 pp. Office of Technical Services, Washington 25, D.C. $2.50.

An extensive research with a view to alloy investigation by thermoelectric methods; includes thermoelectric properties of platinum-lead and lead-rhodium alloys.

METALLURGY

723 Physical Chemistry of Process Metallurgy. Part 1 **G. R. St. Pierre (Editor)**

Book, 1961, 644 pp. Interscience Publishers, New York and London. £8 9s. 0d.

Papers read at an International Symposium sponsored by the AIME at Pittsburgh, April-May, 1959, included
"The Structure of Surface Oxide Films on Molten Alloys" by K. Niwa, G. Shimaoka and I. Yamai (including lead, lead-tin, lead-zinc, lead-cadmium, lead-antimony, lead-bismuth).
"Velocity of Sound in Liquid Lead-Tin Alloys" by R. B. Gordon.

724 Physical Chemistry of Process Metallurgy. Part 2 **G. R. St. Pierre (Editor)**

Book, 1961, pp. 647–1374. Interscience Publishers, New York and London. £9 8s. 0d.

Part 2 includes "Equilibria between Lead, Lead Sulphide, and Cuprous Sulphide and the Decopperising of Lead with Sulphur" by R. F. Blanks and F. M. Willis.

725 Orientation Relationships in the Heterogeneous Nucleation of Solid Lead from Liquid Lead **B. E. Sundquist and L. F. Mondolfo**

Trans. AIME Met. Soc., June, 1961, 221(3), 607–613.

Effects obtained using nickel, copper, silver and germanium to nucleate solid lead from the liquid. Description of results and theory of nucleation.

726 The Distribution of Deformation in Lead Fatigued in Vacuo **K. U. Snowden**

Phil. Mag., March, 1961, 6(63), 321–327.

Reverse-plane bending fatigue experiments carried out in vacuo on polycrystalline specimens of high purity lead. Slip occurred and grain boundaries migrated to positions of greater stability at $\pm$ 45° to the principal stress axis.

727 Creep of Metals under Simple Shear (Pb and Cd) **E. N. da C. Andrade and K. H. Jolliffe**

Nature, April 29, 1961, 190, 431–432.

For strains above 0.03 with polycrystalline lead the cube root law holds. For smaller strains the square root law applies.

728 Effect of Low-Temperature Pretreatment on Age-Hardening Behaviour of Various Alloys **H. Bochers, M. Kainz and S. Pixner**

Z. Metallkunde, April, 1961, 52(4), 276–279.

(In German.) Results on 2% and 8% antimonial lead alloys (among others), pretreatment at temperatures ranging from —5° to —195°C, depending on the material.

729 **A Thermodynamic Study of Dilute Solutions of Sulphur in Liquid Tin and Lead** — **L. L. Cheng and C. R. Alcock**

Trans. AIME Met. Soc., April, 1961, 221(2), 295–300.

Liquid solubility and free energy of solution of sulphur in molten lead and tin at 500° and 680°C obtained by radiochemical study.

730 **Liquid-Solid Phase Distribution Studies in the Systems Iron-Lead, Cobalt-Lead, Chromium-Tin and Nickel-Silver** — **D. A. Stevenson and J. Wulff**

Trans. AIME Met. Soc., April, 1961, 221(2), 271–275.

Covers solubility of iron and cobalt in molten lead (and other systems) up to 1300C. Analysis of molten samples at different temperatures used to provide graphs of relationship between log mole fraction of solute and inverse of absolute temperature.

METALLOGRAPHY

731 **Chemical Polishing of Lead and its Alloys** — **R. C. Gifkins**

Metallurgia, April, 1961, 63, 209–210.

Describes the technique using Worner and Worner reagent (a 70 : 30 mixture of glacial acetic acid and 100 vol. H_2O_2) to obtain a satisfactory chemical polish.

POWDER METALLURGY

732 **Continuous Production of High Strength Lead Strip by Direct Powder Rolling** — **S. Storchheim and A. Cross**

Planseeberichte für Pulvermetallurgie, April, 1961, 9(1/2), 21–25.

Higher strength and creep resistance, particularly at high temperatures, are claimed for lead strip produced by direct rolling of powder. The material has been specifically developed for shielding aircraft nuclear reactors at 300°F and maximum stress 300 psi. Details of production technique are given.

REFINING

733 **Thermodynamic Investigation of Processes Taking Place on the Dezincing of Lead by Chlorine Gas** — **Z. Horvath and J. Weber**

Acta Technica Acad. Sci. Hungaricae, 1961, 33(1/2), 27–51.

The thermodynamic potential of the reactions in the Betterton process is calculated. Various activities are determined.

SMELTING

734 **The Joint Production of Zinc, Lead and their By-Product Metals at the Balen (Belgium) Smelter of Societe des Mines et Fonderies de Zinc de la Vielle Montagne** — **L. Marck**

Erzmetall, March, 1961, 14(3), 113–123.

(In German.) A detailed description of the operation of this smelter which has now been developed to produce zinc, lead, cadmium, germanium, silicon, sulphuric acid and copper sulphate.

735 **Structure and Properties of Smelter Slags. 3. Viscosity Measurements on Industrial Slags from Lead and Copper Smelting** — **H. Winterhager and R. Kammel**

Erzmetall, July, 1961, 14(7), 319–328.

(In German.) Measurements on industrial lead blast furnace slags at 1000–1400°C. Slags from smelters all over the world were used, detailed analysis being given for 41 lead slags, the viscosities being plotted separately.

SOLDERS

736 **How to Design the Soldered Electrical Connection** — **H. H. Manko**
Product Eng., June 12, 1961, 32(24), 27–64.

Describes design procedures and gives properties and corrosion resistance of tin-lead and other alloys.

737 **A Displacement Copper System for the Soldering of "Pure Aluminium"** — **S. L. Matlow**

J. Electrochem. Soc., July, 1961, 108(7), 709–710.

After copper coating the aluminium wire it is tinned by dipping in 60/40 lead/tin at 200°C and soldered using a cored 60/40 solder.

STATISTICS

738 **Non-Ferrous Scrap in the European Common Market** — **H. Schroeder**

Metall, May, 1961, 15(5), 463–467.

(In German.) Detailed statistical description of lead, aluminium, copper zinc scrap situation in Common Market countries; consumption, import, export, tariffs and restrictions.

739 **Lead and Zinc in a Changing World** — **R. L. Stubbs**

Paper, Amer. Zinc Inst. and Lead Industries Assoc., Chicago, May 2, 1961. 11 pp.

Overall survey of trends in consumption throughout the world. Some reference is made to uses of the metals and an attempt made to look into the future.

PART 2 · PATENTS

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ANODES

740 Lead Anodes for Cathodic Protection — **Metal & Pipeline Endurance Ltd. W. T. Glover & Co. Ltd. D. Pollard W. Atkin**

British Patent 875892

Anodes for cathodic protection sometimes take the form of long flexible cable-like bodies, having a good conductor of electricity as the core, a layer of waterproof material and an outer layer of lead alloy. This invention provides for electrical conductors passing from the core to the lead sheath, at regular intervals. These pass through the waterproof layer and means are described whereby these openings are filled with a waterproof adhesive.

BATTERIES

741 Positive Plate — **Electric Auto-Lite Co.**

South African Patent 61/765

This is a conventional type positive plate, but having the lead oxide particles held together by small discreet grains of thermoplastic resin.

742 Dry Charge Positive Plate: Elimination of Chemical Activity — **Electric Auto-Lite Co.**

South African Patent 61/816

Chemical activity between lead dioxide and lead alloy grid, is reduced by separating these two members by a third substance.

743 Dry Charge Negative Plates — **Chloride Batteries Ltd.**

Indian Patent 71415

Individual particles of spongy lead on the charged negative plate are protected from oxidation by being coated with a lead soap or soaps.

744 Electrolyte — **Electric Storage Battery Co.**

Indian Patent 71101

To the conventional sulphuric acid electrolyte there is added an aromatic aldehyde or an oxidised or reduced derivative thereof.

745 Tubular Batteries — **Tudor A.B.**

British Patent 874862

It is usual, in tubular batteries, to make the separator sheaths impermeable in those parts which are immediately adjacent to the container walls. As a result, only half the pastes in the pencils at the two ends of a plate becomes active. This invention eliminates these ineffective pastes, by making the end pencils in a semi-circular form. The flat sides of these pencils, facing the container wall, are impermeable. In this way the number of fully active pencils may be increased.

746 Phosphorous Compounds added to Leaded Petrols **Esso Research & Engineering Co.**

British Patent 875363

Phosphorous, in the form of a soluble organic compound, is often added to petrols to improve the nature of the combustion deposits. It is added to leaded petrols in the form of aryl phosphates or phosphites as, unlike the alkyl phosphorous esters, these do not read with the lead compounds and so lower the octane rating. It has now been found that esters of phosphorous based on C8-Oxo alcohols can be used without any adverse effects: in some cases they produce a small improvement.

747 Process for making Battery Separators **M. Vedovelli**

British Patent 878639

This patent describes a process of making separators which are formed from two sheets, say of glass fibre and paper, stuck together with a synthetic resin, and in a form to give a ribbed structure. These separators are claimed to fulfil all requirements and are, in addition, quite thin.

748 Method of making Battery Separators **Institut für Zellstoff und Papier**

British Patent 873567

The separators are made from organic or inorganic fibres (of natural or synthetic origin) on a paper-making machine. The fibres have previously been sized in suspension with an aqueous synthetic plastic dispersion, precipitated by potassium-aluminium sulphate. Fillers such as kaolin talc or blanc fixe are also incorporated.

749 Grid Alloys **Accumulatoren-Fabrik A.G.**

German Patent 1113579

The composition of this alloy is given as 5 to 11% antimony, 0.01 to 0.075% arsenic and 0.04 to 0.12% copper, balance lead.

750 Porous Electrodes **Heberan and Others**

South African Patent 61/839

A binding agent is added to the positive or negative active powders. This consists of the oxides of silicon aluminium, magnesium, titanium or calcium in the form of very fine particles and is intimately mixed with 20 to 100 times the quantity of lead oxide. This is worked into a spreadable paste by the addition of dilute sulphuric acid.

751 Battery Separators — **Accumulatoren-Fabrik A.G.**

British Patent 875943

A battery separator, having a large pore volume, but small pore radius and good mechanical strength, may be made by sintering, for 30 seconds or less, a synthetic material such as polyvinyl chloride. The resin must be in the form of fine particles, the range of size of the latter being closely controlled.

752 Dry Charged Negative Plate: Method of Manufacture and Plant — **Boliden Batteri A.B.**

British Patent 875974

The protective agent is applied to the plate in such a manner as to leave a higher concentration on the outside (exposed) surface than in the interior. A description is also given of the plant, which comprises dipping tanks, drying chambers, ducts, etc.

753 Battery Grid — **J. I. M. Artajo**

British Patent 872029

In this form of grid, the active paste is contained between pair of sheets of ribbed material held together to form elongated pockets. Several such pairs are joined by their edges at right angles to a common plate and so arranged parallel to each other. This unit is then interleaved with another similar unit (but containing paste of the opposite nature, to form the other electrode), and the whole comprises a cell.

754 Shearing of Battery Grids — **C. A. Bergsoe**

British Patent 875432

After a battery grid is released from the mould of a conventional automatic machine, it falls or slides into the shearing guillotine: sometimes a small conveyor is used. The grids are allowed sufficient time to cool, or to be inspected. In order to save space, this invention places the guillotine below the casting machine and provides a chute, the angle of which can be varied, and a stop bar, which can be removed when the angle of the chute is increased.

BEARINGS

755 Lead Bronze Bearing — **H. Gieren**

British Patent 877526

A lining of lead bronze is centrifugally cast on to the inner service of a steel cylinder. The lining and the outside of the steel wall are both machined to the required thicknesses, after which the cylinder is divided into sections and the semi-cylindrical half shells are pressed to size. Subsequently, these shells may be subjected to a finishing operation.

ELECTRONICS

756 Permanent Magnets — **International Business Machines Corporation**

French Patent 1272316

These magnets are solid state solutions of $LaSrCo_2O_6$ and $Pb_3WFe_2O_9$ in proportions of 1 : 2 to 1 : 16. Details are given for their preparation by mixing the metallic oxides in predetermined portions, calcinising between 850°C and 950°C in an oxidising atmosphere, and cooling under controlled conditions.

757 Ferroelectric Ceramics — **Council of Scientific and Industrial Research**

Indian Patent 69062

This material is the reaction product of lead metaniobate and barium meta titanate.

MINING

758 Froth-flotation Machine — **A. Motosi**

British Patent 878030

This machine comprises, essentially, a hollow rotating drum mounted in a vat fitted with suitable baffles. The pulp is introduced into the drum where it is thoroughly mixed and then thrown into the vat by centrifugal force through slots in the drum. Suitable skimmering devices are provided in the vat. Because the valuable constituents do not flow counter to the descending gauge, and for other reasons, this apparatus is smaller and more compact than conventional models, and may, indeed, be portable.

PAINTS

759 Non-Toxic Lead Paints — **Associated Electrical Industries**

British Patent 873917

The lead constituent of the paint is represented by a chelated compound such as lead di-sodium (or dilead) ethylene diamine tetra acetate. These compounds are white and the paint may therefore be made in various colours by the addition of suitable pigments. The medium may include synthetic resins.

SHOT

760 Improved Shot — **K. P. Morritt**

British Patent 875624

It is claimed that shot, the surface of which is indented, has greater range and less spread than shot which is smooth and spherical. The shot is made in the usual way and then rolled between moving platens, the surfaces of which have suitably shaped projection which will form the necessary indentations.